亚热带浅水湖泊浮游植物群落和生物量的变化特征

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The community composition and biomass of phytoplankton in shallow lakes are impacted by many environmental factors including water quality physicochemical parameters, land use in the watershed, and lake morphology. However, few studies have simultaneously evaluated the relative importance of these factors on the effect of community composition and biomass of phytoplankton. The relative importance of the water quality physicochemical parameters (water temperature [WT], total nitrogen [TN], total phosphorus [TP], pH, dissolved oxygen [DO], electrical conductivity [EC], turbidity and Secchi depth [SD]), land use (built-up land, farmland, waters, forest, grassland, and unused land) in the watershed, and lake morphology (area and depth) on the composition and biomass of phytoplankton communities were assessed in 29 subtropical shallow lakes in Wuhan, China, during different seasons from December 2017 to

November 2018. The results showed that phytoplankton in all 29 lakes was mainly composed of Cyanophyta, Chlorophyta, and Bacillariophyta. Phytoplankton abundance was highest in summer and lowest in winter. We analyzed the relative importance of the three groups of variables to the community composition of the phytoplankton by variance decomposition. The results showed that the three groups of environmental variables had the highest explanation rate (> 80%) for the composition of the phytoplankton community in summer and autumn, and the explanation rates in spring and winter were 42.1% and 39.8%, respectively. The water quality physicochemical parameters were the most important variables affecting the composition of phytoplankton communities, followed by land use in the watershed. Through generalized additive model and structural equation model analysis, we found that the land use and lake morphology had minimal direct impact on the Chl-a and cell density of phytoplankton, mainly by altering the TN, TP, turbidity, SD, DO, and EC, which indirectly affected phytoplankton. WT and nutrients were still the main predictors of phytoplankton abundance. Built-up land was the main source of nitrogen and phosphorus in lakes. Correlation analysis found that forest and grassland had positive impacts on reducing lake nitrogen and phosphorus contents. This showed that increasing grassland and forest in the watershed could reduce the pollutants entering the lake. Our findings will contribute to water quality management and pollution control for subtropical shallow lakes.

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